

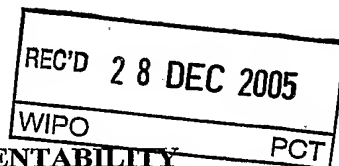
## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference P20-03716	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/SE2004/002020	International filing date (day/month/year) 27.12.2004	Priority date (day/month/year) 29.12.2003
International Patent Classification (IPC) or national classification and IPC See Supplemental Box		
Applicant ATLAS COPCO TOOLS AB et al		

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
  - ☒ (sent to the applicant and to the International Bureau) a total of 3 sheets, as follows:
    - ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

- This report contains indications relating to the following items:
 

<input checked="" type="checkbox"/>	Box No. I	Basis of the report
<input type="checkbox"/>	Box No. II	Priority
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input type="checkbox"/>	Box No. VI	Certain documents cited
<input type="checkbox"/>	Box No. VII	Certain defects in the international application
<input type="checkbox"/>	Box No. VIII	Certain observations on the international application

Date of submission of the demand  11.07.2005	Date of completion of this report  25.11.2005
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer  Katarina Ekman/MP Telephone No. +46 8 782 25 00

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.  
Continuation of: Cover sheet

**B25B 23/145 (2006.01)**

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2004/002020

## Box No. I Basis of the report

## 1. With regard to the language, this report is based on:

- ☐ the international application in the language in which it was filed
- ☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b))
- ☐ publication of the international application (Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-7 \_\_\_\_\_ as originally filed/furnished
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the claims:
- pages \_\_\_\_\_ as originally filed/furnished
- pages\* 11-13 \_\_\_\_\_ as amended (together with any statement) under Article 19
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the drawings:
- pages 1-2 \_\_\_\_\_ as originally filed/furnished
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2004/002020

**Box No. V** Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	<u>1-6</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-6</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-6</u>	YES
	Claims		NO

## 2. Citations and explanations (Rule 70.7)

Document cited in the International Search Report:

D1. WO 02/102554 A1

D2. WO 02/083366 A1

The cited documents represent the general state of the art.  
The invention defined in the claims 1-6 amended under Article 19 is not disclosed by any of these documents.

After reconsideration, the cited prior art does not give any indication that would lead a person skilled in the art to the claimed method and power tool system for screw joint tightening.

Therefore, the claimed invention is not obvious to a person skilled in the art.

Accordingly, the invention defined in claims 1-6 is novel and is considered to involve an inventive step. The invention is industrially applicable.

## AMENDED CLAIMS

[received by the International Bureau on 17 June 2005 (17.06.2005);  
original claims 1-5 replaced by amended claims 1-6]

Claims.

1. Method for tightening a screw joint to a desired target torque level by means of an impulse wrench having an impulse unit with a motor driven inertia drive member, and a programmable control unit arranged to control the power supply to the impulse wrench according to the following steps:

- a • starting a screw joint tightening process at a reduced power supply to the impulse wrench,
- c • determining the instantaneous torque magnitude and calculating the torque growth during a number of delivered impulses,
- d • increasing after the very first delivered impulse the power supply to the impulse wrench in response to the calculated torque growth,
- e • reducing the power supply to the impulse wrench in response to the instantaneous torque magnitude and to the calculated torque growth during each impulse after the instantaneous torque magnitude has reached a predetermined part of the desired target torque level, and
- f • interrupting the power supply to the impulse wrench as the target torque level has been reached.

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PCT

2. Method according to claim 1, wherein the power supply is increased after the very first delivered impulse to an optimum magnitude determined by the calculated relative torque growth and the installed torque magnitude during the very first delivered impulse in relation to the target torque level.

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3. Method according to claim 1 or 2, wherein the angular displacement and retardation magnitude of the inertia drive member during each delivered impulse is ascertained and the instantaneous torque magnitude is calculated therefrom.

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4. Power wrench system for tightening a screw joint to a desired target torque level, comprising a torque impulse wrench, a programmable control unit, and a power supply means connected to the impulse wrench and governed by the control unit, wherein the impulse wrench comprises an impulse unit with a motor driven inertia drive member, and an angle sensing means is connected to said inertia drive member to detect the angular movement of said inertia drive member,

characterized in that

- said power supply means is controlled to supply the impulse wrench with a reduced power until the very first impulse is delivered to the screw joint being worked,
- said control unit is arranged to receive signals from the angle sensing means and to determine the angular displacement and the retardation magnitude of the inertia drive member during each delivered impulse, and to calculate the delivered torque as well as the torque growth per angle increment during each impulse, and
- said control unit is arranged to increase the power supply to the impulse wrench after the very first impulse has been delivered, to reduce the power supply to the impulse wrench as the instantaneous torque magnitude has reached a predetermined part of the target torque level, and to interrupt the power supply to the impulse wrench as the target torque level has been reached.

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5. Power wrench system according to claim 4, wherein the impulse wrench is pneumatically powered, and said power supply means comprises a valve connected to the control unit and arranged to vary the pressure air supply to the impulse wrench between zero and a full power flow as determined by the control unit.

- fd krev 5 6. Power tool system for screw joint tightening, comprising a pneumatic impulse wrench (10), and a control unit (22) programmable according to a desired tightening strategy including a set value or values of one or more tightening parameters of a target torque level, wherein said impulse wrench (10) includes a pressure air driven motor (11) with a rotor (12), an impulse unit (13) with an inertia drive member (14) connected to the motor rotor (12), and a pressure air supply means (25,26) connected to the motor (11),
- c h a r a c t e r i z e d in that
- an angle encoder (16) is connected to the control unit (22) and arranged to detect the angular movement of said inertia drive member (14),
  - said control unit (22) comprising a means for ascertaining during tightening and based on the detected angular movement of said inertia drive member (14) the instantaneous value or values of one or more tightening parameters at each torque impulse and for comparing the instantaneous parameter value or values with the set parameter value or values of the target torque level, and
  - said pressure air supply means (25,26) is connected to the control unit (22) and comprising a flow regulating device (26) which is arranged to successively adjust during tightening the pressure air flow to the motor (11) in a range between zero and full power flow as determined by the control unit (22).